Woolf Bond Planning

Land at Newhouse Farm Industrial Estate, Chepstow

Air Quality Assessment

January 2010






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1 Introduction

1.1 RPS Planning and Development Ltd (RPS) was appointed to undertake an air quality assessment to support a planning application for a change of use in order to operate a wind turbine tower production facility. There is existing planning permission for B1 (business) and B8 (storage and distribution) uses to take place in the existing Unit B, but the client is seeking planning permission to extend this to include B2 (general industrial). The existing Unit B is to be extended to include Unit C (see Figure 1).

1.2 Unit B forms part of the Newhouse Farm Industrial Estate, Chepstow, which is located south of Junction 2 of the M48. It is located within the administrative area of Monmouthshire County Council (MCC), which has designated two Air Quality Management Areas (AQMAs) within the county due to high levels of nitrogen dioxide (NO_2) emissions, attributable to traffic. The proposed development is not located within the AQMA.

1.3 The construction of the proposed wind turbine tower production facility is expected to result in localised and temporary changes to local traffic flows, which are unlikely to have a significant impact on air quality. Similarly, construction dust effects would be temporary and localised; as such, construction dust effects are unlikely to be significant.

1.4 The operation of the proposed wind turbine tower production facility would significantly reduce the number of vehicle trips generated during both peak periods and a daily period in comparison with the consented B1 and B8 uses, thereby leading to an improvement in traffic flows on the M48 and consequently on air quality. Further details are available in the Transport Assessment.

1.5 However, the operation of the wind turbine tower production facility could potentially be associated with emissions of volatile organic compounds (VOCs), suspended particulate matter (PM), nuisance dust and isocyantes. These releases are expected to be controlled by relevant pollution regulatory authority under the Environmental Permit Regulations, which would require compliance with emission limits for the aforementioned pollutants, to prevent environmental harm.

1.6 Volatile organic compounds are released during coating and spraying of the wind turbine tower components using coatings, which contain VOCs. There is the potential for these VOCs to lead to odours as they can easily vaporise at room temperature. They could either enter into the atmosphere via point sources or escape fugitively. In addition, there is also the potential for fugitive dust emissions to be released during the operation of the facility.

1.7 This assessment therefore assesses if the development, whether or not some aspects are subject to pollution regulatory control, might nevertheless cause serious detriment to the amenity of surrounding land uses. The assessment therefore focuses on:

- the likely effects of fugitive dust and odour released during the operation of the wind turbine tower production facility;
- the likely effects of point source odour emissions associated with the operation of the wind turbine tower production facility; and
- the typical VOCs concentration expected to be released from the facility compared with the VOC emission limit.

1.8 The methods and criteria used to assess these likely effects on air quality are described in the following sections. Where potentially adverse environmental effects have been identified, measures to eliminate, reduce or mitigate the effects have been recommended.

2 Site and Process Description

Site Description

2.1 The proposed development site, shown in Figure 1, is located in the north western corner of Newhouse Farm Industrial Estate, and lies south of Junction 2 of the M48.

2.2 The site covers approximately 16.55 hectares in total, and comprises three distinct parcels of land, referred to as Area A, B and C. Area A extends to 3.6 hectares and comprises a relatively flat, cleared parcel of land. Area B consists of Unit B an existing constructed warehouse building (Use Class B8) and Area C is an open area. Area B and C together extend to 12.95 hectares.

2.3 A retaining wall, which varies in height from 4 to 9 metres, borders the plateau to the north, east and west of the site. Beyond this, the land rises to the ridge of an artificial bund before falling again to the artificial ground level. The ridge of the bund varies in height; to the north and west it is slightly higher than the ridgeline of Unit B, whereas to the east it is slightly lower.

2.4 Unit B, the existing distribution warehouse will be retained and linked to a new building on Area C via a canopy. The western part of the building (Unit B) is to be used for fabrication of towers, to house the administrative functions, and provide employee facilities, such as changing rooms and canteen. The link between the two buildings is to be used for the storage of materials and shot blasting. The eastern part of the building is for the finishing i.e., paint spraying of the wind turbine towers.

2.5 Area A is to be used for storage of the finished wind turbine towers prior to shipment. This site will comprise an area of hardstanding, a surface-water balancing lagoon and landscaping periphery.

Process Description

2.6 The proposed wind turbine tower production facility is designed to operate at a maximum capacity of 300 towers per year, although it is likely to operate at around 100 towers per year initially. It is envisaged that, when operating at the initial reduced capacity of 100 towers per year, the proposed scheme would create approximately 100 jobs, 20 of which would be white-collar and 80 of which would be blue-collar. When operating at a maximum capacity of 300 towers per year, it is envisaged that the number of blue-collar jobs could increase to as many as 150.

2.7 The process of activities within the facility is as follows:

- The process begins with the delivery of raw materials to the site, e.g. flat steel plates. These are loaded from the delivery vehicles into the stockyard using an overhead crane.
- The plates are then loaded and processed through the blasting machine, into Unit B.
- The plates are then loaded onto the profiling machine, which cuts the plates to the correct size.
- The plate is then rolled into a cylindrical shape by the roll-forming machine (maximum cylinder diameter is 5 metres).
- Each cylinder (can) is then seam welded by the submerged arc column and boom system and around 30% of the cylinders have an additional assembly and welding process to attach the flanges.
- The cans are then transferred by conveyor into the next assembly area and have internal fitments welded in before further processing.
- The next stage of processing involves the welding together of individual cans, to form a longer section, performed by submerged arc welding (maximum length of each section is 36 metres).
- Each completed section is then moved along the production line into an inspection and testing area.
- Transfer of sections within Unit B is likely to be performed by purpose-designed ground-based conveyors.
- Completed sections are transferred out of Unit B into a holding area between and then into a purpose-designed booth for shot blasting.
- Next, the sections are transferred into a purpose-built spray booth for painting (Area C). The paint booth sucks in air to facilitate drying, and vents-off the air via 11 stacks located above the roof of Area C.
- Painted sections are sent to a separate area for fitting of the ladders and bus bars and final inspection.
- Transfer of the sections within the paint booth (Area C) is likely to be performed by purpose-designed ground-based conveyors.
- Completed sections are then transferred out of Area C and moved to the completed stock / open-storage location (Area A). This is likely to be performed by purpose built fork lift type trucks.
- Removal from the completed stock/open-storage location for delivery to the customer will be performed by special purpose vehicles.

3 Relevant Legislation, Planning and Policy Framework

European Legislation

3.1 The European Union Framework Directive 1996/62/EC on ambient air quality assessment and management came into force in November 1996 and had to be implemented by Member States, including the UK, by May 1998. The Directive aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants. As a Framework Directive it requires the Commission to propose and set "Daughter" Directives prescribing air quality limit values and alert thresholds together with guidance on monitoring and measurement of individual pollutants. Neither odour nor nuisance dust come within the scope of this Directive.

3.2 A new EU Directive 2008/50/EC on ambient air quality, replacing all previous directives is to be implemented by Member States by June 2010. Again, neither odour nor nuisance dust come within the scope of this Directive.

National Legislation

3.3 The Air Quality Standards (England) Regulations 2007 implement the limit values prescribed by current EU Directives, 1996/62/EC, as legal limits within England. Odour does not come within the scope of these regulations.

Pollution Regulation

Solvent Emissions Directive

3.4 The European Community (EC) Directive 1999/13/EC (Solvent Emissions Directive (SED)) on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations came into force on 11 March 1999 and is implemented in England and Walese through the Environmental Permitting Regulations. The purpose of this Directive is to prevent or reduce the direct and indirect effects of emissions of volatile organic compounds into the environment, mainly into air, and the potential risks to human health, by providing measures and procedures to be implemented for the activities defined in Annex I, in so far as they are operated above the solvent consumption thresholds listed in Annex IIA.

3.5 There are a number of Annex 1 activities, the activity relevant to the operation of the proposed wind turbine tower production facility is the 'coating of metallic surfaces'.

3.6 The VOC emission limit values for the coating of metals, plastic, textile, fabric, film and paper coating stipulated under Annex IIA is provided in Table 3.1.

Table 3.1: VOC Emission Limit Values for Coating Facility

Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases (mgC. Nm^3)	Fugitive emission values (% of solvent input)
5 -15	100 (1)	25
>15	50/75 (2) (3) (4)	20

Notes: (1) Emission limit value applies to coating application and drying processes operated under contained conditions.
(2) The first emission limit value applies to drying processes, the second to coating application processes.
(3) For textile coating installations which use techniques which allow reuse of recovered solvents, the emission limit applied to coating application and drying processes taken together shall be 150.
(4) Coating activities which cannot be applied under contained conditions (such as shipbuilding, aircraft painting) may be exempted from these values, in accordance with Article 5(3)(b).

3.7 On 21st April 2004, the SED was amended through article 13 of the Paints Directive (Directive 2004/42/EC) [1]. The Paints Directive is implemented in the UK by the 'Volatile Organic Compounds in Paints, Varnishes and Vehicle Refinishing Products Regulations' 2005 [2]. This document defines a VOC as follows,

'*any organic compound having an initial boiling point less than or equal to 250°C measured at a standard pressure of 101.3 kPa'*.

It also stipulates the maximum VOC contents limit ($g.l^{-1}$) for paints, varnishes and vehicle refinishing products used in the UK.

Nuisance

3.8 The control of odours from premises not regulated under other environmental regulations relies upon the statutory nuisance controls detailed in Part III of the Environmental Protection Act 1990, which are enforced by local authorities. A statutory nuisance can be *"any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance.* For a nuisance action to succeed the offence also has to be a cause of material harm or to be persistent or likely to recur. If the local authority environmental health department is satisfied that a nuisance exists, steps will be taken to abate the nuisance: this may involve serving a legal notice (an Abatement Notice) requiring the execution of such works and other steps necessary to abate the nuisance. If ignored this can result in proceedings in the Magistrates Court and imposition of an order to prevent the nuisance and a fine. The Act provides a defence for the operator to demonstrate that the 'Best Practicable Means` (BPM) have been used to control potential nuisance.

3.9 Environmental health departments have a duty to 'police' their districts for statutory nuisance. This includes, wherever practicable, investigating any complaint about nuisance from a member of the public and to inspect their area for nuisance from time to time.

3.10 Statutory nuisance may well also be an "ordinary" nuisance at common law. It may still be possible for tort proceedings to be brought by persons aggrieved by the common law nuisance by applying directly to the Magistrates Court, if for any reason the local authority is unwilling to act on their behalf.

Environmental Permitting

3.11 The Environmental Permitting (England and Wales) Regulations 2007 [3] came into force on 6 April 2008. This single new regime implements nationally EU Integrated Pollution Prevention and Control (IPPC) Directive and replaces the two previous national regulatory systems, namely the Pollution Prevention and Control Regulations 2000 (PPC) and the Waste Management Licensing Regulations (WML). The new EP Regulations do not significantly alter the workings of the previous regimes.

3.12 The Local Authority Integrated Pollution Prevention and Control (LAIPPC), which covers A2 installations; and Local Authority Pollution Prevention and Control (LAPPC), which covers Part B installations, were previously regulated under the PPC Regulations 2000 and are now regulated under the Environmental Permitting Regulations [4].

3.13 The proposed wind turbine tower production facility is a Part B installation and would be regulated by the local authority under the Environment Permitting Regulations, Schedule 1, Part 2 - Section 6.4 - Coating Activities, Printing and Textile Treatments, Part B.

3.14 To enable local authorities to regulate consistently these Part A2 or Part B installations, the Secretary of State for Environment, Food and Rural Affairs provides Process Guidance (PG) notes for the different processes. The PG notes form part of the statutory guidance on what constitutes Best Available Techniques (BAT).

3.15 The Secretary of State's Guidance for Coating of Metal and Plastic Processes - Process Guidance Note 6/23(04) [5] is the statutory guidance applicable to the proposed wind turbine tower production facility. PG note 6/23 (04) includes the mandatory VOCs emissions limits stipulated in the Solvents Emissions Directive [6], which applies to this facility.

National Planning Policy

3.16 Government Planning Policy Statement 23, *Planning and Pollution Control* (PPS23) [7] gives guidance to local authorities on the relationship between controls over development under planning law, and under pollution control legislation.

3.17 PPS23 states that *"pollution issues should be taken into account as appropriate in planning decisions (having regard to development plan documents and all material considerations). Where for example, new housing is proposed close to a source of potential pollution from the normal operation of the process on the potential impacts and the extent to which the proposals address such risks will influence whether or not a development should proceed.."*

3.18 Planning applications that are in accordance with the relevant development plan should be allowed unless material considerations indicate otherwise. PPS23 states that any air quality consideration that relates to land use and its development is capable of being a material planning consideration. However, the weight given to air quality in deciding the application will depend on such factors as: the severity of the impacts on air quality; the air quality in the area surrounding the proposed development; the length of time people are likely to be exposed; and the positive benefits provided through other material considerations.

3.19 PPS23 states that matters to be considered in the preparation of development plan documents and in the consideration of individual planning applications where pollution considerations arise should include (amongst other matters):

- the possible impact of potentially polluting development on land use;
- the potential sensitivity of the area to adverse effects from pollution;
- the economic and wider social need for development;
- the need to identify land, or establish criteria, for the acceptable location of potentially polluting developments and the availability of alternative sites;
- the need to separate necessary but potentially polluting and other land uses so as to reduce conflicts, for example by identifying where necessary areas around existing sources of pollution (including roads) in which proposed new developments and uses should be carefully considered in terms of their potential as pollution receptors; and
- the possibility that (whether or not some aspects of the development are subject to pollution control), emissions of smoke, fumes, gases, steam, smell, vibration or noise from the development might nevertheless be seriously detrimental to amenity in addition to constituting a statutory nuisance.

3.20 In discussing Air Quality Management Areas (AQMAs), PPS23 states that it is not in all cases that planning applications should be refused if the development would result in deterioration of local air quality; however, all such applications should be supported by such information as is necessary to allow a full consideration of the impact of the proposal on the air quality of the area. Local Planning Authorities must be satisfied that planning permission can be granted on land-use grounds taking full account of environmental impacts.

Local Planning Policy

3.21 MCC adopted its current Unitary Development (UDP) on 22nd June 2006 [8]. The adopted UDP contains detailed policies that will be used in the assessment of all planning applications that come before the council, and will guide any new development that is likely to take place up until 2011 when it will be replaced by the Local Development Plan.

3.22 Policy ENV5 of the UDP relating to pollution states that,

'*All development proposals will be required to ensure that technical measures relevant to the activity are undertaken to prevent or minimise pollution'*

3.23 This policy is designed to ensure that development requiring planning permission, as far as possible, does not cause significant deterioration in existing environmental standards.

4 Methodology

Approach

4.1 The approach to the assessment has been informed by consultation undertaken with the Environmental Health Officer (EHO) at MCC[i].

4.2 The approach to this air quality assessment includes the following key elements:

- qualitative assessment of potential fugitive odour and dust effects associated with the operation of the wind turbine tower production facility;
- quantitative assessment of point source odour emissions associated with the operation of the wind turbine tower production facility; and
- comparison of the typical VOCs concentration expected to be released from the facility with the VOCs emission limit of 50 $mgC.m^{-3}$.

Summary of Key Pollutants

4.3 The key emissions associated with the operation of the wind turbine tower production facility are VOCs, particulate matter (PM), dust and isocyantes. These releases are expected to be controlled by relevant pollution regulatory authority under the Environmental Permit Regulations, which would require compliance with Emissions Limit Values (ELVs) for the pollutants.

4.4 This assessment, therefore, focuses on the amenity effects of dust and odours released during the operation of the wind turbine tower production facility. In addition, the assessment also confirms whether the expected VOCs ELV for the facility is likely to be achieved.

Methodology for Quantitative Assessment of Point Source Odour Emissions

Dispersion Model

4.5 The odour impacts associated with point source emissions of VOCs-containing coatings used within the wind turbine tower production process were predicted using ADMS 4.1, a version of the Atmospheric Dispersion Modelling System (ADMS), which is a PC-based model representing dispersion of pollutants from industrial sources.

[i] Telecon with Paul White at Monmouthshire County Council, 05 January 2010.

4.6 ADMS 4.1 is a practical dispersion model developed by Cambridge Environmental Research Consultants (CERC) that models a wide range of buoyant and passive releases to the atmosphere either individually or in combination. ADMS brings together the results of recent research on dispersion modelling. The model calculates the mean concentration over flat terrain and also allows for the effect of plume rise, complex terrain, buildings, radioactive decay and deposition. The model has been subject to extensive validation.

4.7 ADMS comprises a number of individual modules each representing one of the processes contributing to dispersion or an aspect of data input and output. Some of the features of ADMS considered within this modelling study are:

Meteorology

4.8 The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability.

4.9 The year of meteorological data that is chosen for a modelling assessment can have a significant effect on the predicted source contribution concentrations. Dispersion model simulations were performed for odour emissions from the proposed development using a representative observing station for the region of the study area, Rhoose, located approximately 52 km south west from the proposed development. Meteorological data for 2000 to 2004 were used in the dispersion modelling. The use of five years of data ensures that the full range of meteorological conditions that will affect dispersion are accounted for in the assessment. From the modelling it was identified that the year 2003 meteorological data represented the worst case and therefore the results of that year have been used for the predictive assessment.

4.10 Figure 2 presents the windroses of meteorological data for Rhoose meteorological station. The windroses shows that the wind direction is predominantly from the west.

Terrain

4.11 The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks, by reducing the distance between the plume centre line and ground level and increasing turbulence and, hence, plume mixing. Although terrain in the surrounding area is not considered likely to give rise to significant effects, terrain data have been included in the dispersion model for completeness.

Surface Roughness

4.12 The roughness of the terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length. The land use within 5 km of the WWTW can be largely characterised as parkland open suburbia. To account for this mixture, a surface roughness length of 0.5 m has been assigned during the meteorological processing in ADMS 4.1.

4.13 The land use at Rhoose meteorological station can also be described as parkland open suburbia, and has therefore been assigned the same surface roughness.

Building Wake Effects

4.14 The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where nearby buildings have heights greater than about 25 - 40% of the height of an elevated stack, downwash effects can be significant.

4.15 There is one dominant building structure (i.e. with the greatest dimensions likely to promote turbulence) on the proposed development site on which the 11 stacks will be located.

4.16 The dimensions of the main building used within the model are listed in Table 4.1.

Table 4.1: Dimension of Main Building Included within the Dispersion Model

National Grid Reference at Building Centre		Length (m) [(a)]	Width (m) [(a)]	Height (m)	Angle (°) From North
x	y				
352993	191285.6	339.9	96.7	14.0	47

Notes: [(a)] Length and width Dimensions are approximate

Emissions Rates used in the Model

4.17 The Environment Agency draft H4 Guidance Note [9] advises that where emissions monitoring at source is not feasible, it is sometimes possible to use mass balance data/solvent use records to estimate the amount of product lost to air over a given period of time.

4.18 Mabey Bridge provided data on:

- the maximum amount of each coatings that the facility is expected to consume per year, when fully operational at 50 weeks in a year at 24 hours a day;
- the chemical composition of each coating material; and
- the volumetric flow rate ($m^3.s^{-1}$) of air via the 11 stacks.

4.19 The usage rate of each coating material per annum, and the percentage composition of each VOC in the bulk material were used to calculate the emission rate of each VOC compound[ii] in $mg.s^{-1}$.

4.20 Then, the VOCs concentration ($mgC.m^{-3}$) of each VOC compound contained in each coating was estimated by dividing the VOC emission rate of each VOC compound ($mg.s^{-1}$) by the volumetric flow rate ($m^3.s^{-1}$) for the 11 stacks.

4.21 Next, the equation from the draft H4 guidance was used to estimate the odour concentration of each VOC compound contained in each coating.

$$D = C_a/T_a$$

Where, D = the odour concentration of a mixture ($ou_E.m^{-3}$)

C_a = the chemical concentration of the VOC compound ($mgC.m^{-3}$)

T_a = the odour threshold of the VOC compound ($mg.m^{-3}$)

4.22 The odour concentration ($ou_E.m^{-3}$) derived for each VOC compound contained in each coating was then multiplied with the volumetric flow rate ($m^3.s^{-1}$) of air via the 11 stacks to estimate the odour emission rate ($ou_E.s^{-1}$) for each VOC.

4.23 The odour emission rates ($ou_E.s^{-1}$) for each VOC contained in each coating were then added together to give a total odour emission rate ($ou_E.s^{-1}$) for the facility was estimated by adding. This gave total emission rate of 14,533 $ou_E.s^{-1}$ for the 11 stacks, or 1,313 $ou_E.s^{-1}$ per stack. Appendix A provides a summary of the calculations used to determine the odour emission rate.

4.24 Other relevant physical characteristics and parameters provided by Mabey Bridge for use within the model are summarised in Table 4.2.

Table 4.2: Dispersion Model Parameters for 11 Stacks

	Per Stack
No of Stacks	11
Height (m)	15.5
Diameter (m)	0.8
Temperature (^oC)	20
Flow Velocity ($m.s^{-1}$)	25

[ii] Only compounds in the coating product that met the definition of volatile, in the Volatile Organic Compounds in Paints, Varnishes and Vehicle Refinishing Products Regulations 2005, were considered to be VOCs.

Odour Sensitive Receptors

4.25 Sensitive receptors are people who are exposed to odour released from a given source, or have the potential to be exposed [9]. Table 4.3 provides the odour sensitivity of various receiving environments reported in the Defra consultation draft on 'Local Authority Guide on Odour Nuisance from Sewage Treatment Works'. [10]

Table 4.3: Odour Sensitivity for Different Land Uses

High Sensitivity	Medium Sensitivity	Low Sensitivity
Residential/living (high-density residential) Residential/living in rural areas (exposure to non- rural odours) Light commercial/ retail/business/ educational/ institutional Open space/ recreational Tourist/ conservation/ cultural	Light industrial	Residential/living in rural areas (exposure to rural odours) Rural (e.g. farms) Heavy industrial Public roads

4.26 There is a public footpath on the north western boundary of the proposed development. Open spaces/ recreational locations are sensitive odour receptors, as shown in Table 4.3.

4.27 Residential dwellings are also located to the north east, north west and south west of the proposed development. Residential receptors are generally classified as 'high sensitivity' to odours, except for the case of rural residential receptors exposed to odours that are themselves of rural character, when they are considered to be of 'low sensitivity'.

4.28 Newhouse Farm Industrial Estate comprises several heavy and light industrial outlets. Heavy and light industrial are also considered sensitive to odour, but with a 'low' and 'medium' sensitivity respectively

4.29 Therefore, receptors have been chosen at the aforementioned areas as these locations are considered to be sensitive to odour, as summarised in Table 4.3.

4.30 In addition, several locations have been chosen on the boundary of the proposed development to check that there are no offensive odours outside of the site boundary. This was at the request of the Environmental Health Officer, who anticipated this as a condition in the Environment Permit.

4.31 ADMS 4.1 has been used to calculate the dispersion of pollutants from the 11 stacks at the chosen receptor locations. The modelled receptors are presented in Table 4.4 and illustrated in Figure 3. All receptors were modelled at a height of 1.5 m, representative of typical head height.

Table 4.4: Modelled Sensitive Receptors and Grid Coordinates

Receptor ID	Receptor Type	Receptor Name	X (m)	Y(m)	Distance to Proposed Development (m)
1	Residential	Somerset Way	353588	191827	533
2		Burnt Barn Road	353522	191889	534
3		Rhodfar Avenue	353388	191870	446
4		Innage	352499	191046	295
5		Mathern House	352392	191092	380
6		Birdwood	352181	191455	636
7		James Stephen	353829	191529	620
8		Caerwen Lane	353827	191660	653
9	Footpath / Boundary	B1	353147	191485	0
10		B2	353210	191435	0
11		B3	352928	191351	0
12		B4	352771	191203	0
13	Boundary	B5	353012	191103	0
14		B6	352870	191026	0
15	Heavy / Light Industrial	B7	353214	191214	70
16	Footpath	B8	353566	191381	370
17	Heavy / Light Industrial	B9	353136	191176	60

Note: m = metres

Averaging Periods Modelled for the Modelling Study

4.32 The threshold of detection for any odour is, by definition, a concentration of 1 European odour unit per cubic metre ($ou_E.m^{-3}$). Stronger odour concentrations are expressed as multiples of this value.

4.33 Although odour is often perceived over very short timescales of minutes or seconds at a time, these rapid fluctuations in concentrations cannot easily be predicted in models, due mainly to the limitations of available meteorological data (which are usually collected in 1-hour intervals). Historically, therefore, predictive odour assessment approaches in the UK have used the findings of empirical studies that related observed levels of odour annoyance to predicted 1-hour average odour concentrations, rather than predicting very short averages directly.

4.34 Therefore, for this odour assessment, the 98th percentile 1-hour average odour concentrations have been modelled.

Significance Criteria for Modelling Assessment

Numerical Odour Guidelines

4.35 There is no statutory limit in England and Wales for ambient odour levels, whether set for individual chemical species, or for mixtures in units of odour concentrations. However, a number of guideline limits and custom and practice standards have been used for different applications.

4.36 The Environment Agency draft H4 guidance provides regulation of odour from processes that are subject to Integrated Pollution Prevention and Control. Though, the draft guidance note H4 does not apply directly to this installation, the general principles in this guidance are applicable to and have been referred to in this assessment.

4.37 For the purposes of IPPC, the Environment Agency proposes in draft H4 that the point at which pollution in the form of offence to the sense of smell is occurring is the point at which there is "*reasonable cause for annoyance*". The aim of odour control is therefore to ensure there is "*no reasonable cause for annoyance*".

4.38 In determining reasonable cause for annoyance draft H4 proposes that the relative offensiveness of odour, its frequency of occurrence, the population density around the site and history of odour complaints should be taken into consideration in setting standards. According to H4, *"no reasonable cause for annoyance"* describes a point where the majority of the exposed population (90%) report that they are not annoyed, i.e. they find exposure at that level is acceptable. This point is based on the lowest corresponding "annoyed" point (i.e. 10%) that could be considered to be statistically significant in the underlying research[11].

4.39 The draft H4 guidance defines this point in numerical terms by means of numerical benchmark criteria and there is *"no reasonable cause for annoyance"* if the numerical benchmark is not exceeded[iii]. The guidance proposes default "Indicative Odour Exposure Standards" of 1.5, 3.0, or 6.0 $ou_E.m^{-3}$, depending on the unpleasantness of the source of odour. These values are 98th percentile, 1-hour average odour concentration at sensitive receptors, predicted from dispersion modelling of source emission strengths. The Indicative

[iii] The H4 guidance is currently being revised and consultation on the revised guidance ended on 13 October 2009, though the final version has not yet been published. The draft-revised guidance does not refer to 'reasonable cause for annoyance'; however the benchmark levels remain unchanged.

Odour Exposure Standards are derived from dose-response studies described in an Environment Agency review [11]. Draft H4 proposes that as a starting point,

- an Indicative Odour Exposure Standard of 1.5 $ou_E.m^{-3}$ at sensitive receptors should apply to processes with the most highly offensive odours, such as those involving putrescible waste, livestock feed factories, waste water treatment works, animal rendering and oil refineries;
- an Indicative Odour Exposure Standard of 6 $ou_E.m^{-3}$ at sensitive receptors should apply to processes with low offensive potential, including bakeries, breweries and confectionery; and
- an Indicative Odour Exposure Standard of 3 $ou_E.m^{-3}$ at sensitive receptors should apply to those processes that do not obviously fall in either the high or low offensiveness categories, for example food processing and intensive livestock.

4.40 Draft H4 proposes that, where appropriate, consideration is then given to adjusting the indicative criteria upwards (i.e. less stringent) or downwards (more stringent) to take account of local circumstances, e.g. to take account of the existing odour character of the area or where odour treatment changes the character of the odour.

4.41 The frequency of odour at any particular receptor location depends on process conditions and local meteorology. The use of a standard based on the 98th percentile of 1-hour average concentrations in a typical year allows for 175 hours per year when infrequent unfavourable weather conditions may lead to poor atmospheric dispersion.

4.42 H4 proposes that these Indicative Odour Exposure Standards should apply to exposure at sensitive receptors, not at the process boundary. Furthermore, H4 states that these Indicative Odour Exposure Standards are not designed to be used as practical limits for policing compliance; rather they are applied when computer dispersion modelling has been used to predict ground level odour concentrations resulting from emissions of a proposed (and existing, if modelled retrospectively) process for the purposes of predicting odour impact or back-calculating the maximum allowable odour emission rate from the source, which finds application in setting emission limit values as conditions in permits.

4.43 The 98th percentile hourly-mean odour concentrations predicted in this assessment have been compared to the Indicative Odour Exposure Standard of 3 $ou_E.m^{-3}$, as odours from a coating process would fall in between the high and low odour offensiveness category. The Indicative Odour Exposure Standard of 3 $ou_E.m^{-3}$ has been compared with the 98th percentile hourly-mean odour concentration predicted at sensitive receptors irrespective of their degree of sensitivity to odour (i.e. low, medium or high), which leads to a worse assessment.

Significance Descriptors

4.44 A number of approaches can be used to determine whether the potential air quality effects of a development are significant. However, there remains no universally recognised definition of what constitutes 'significance'.

4.45 Guidance is available from a range of regulatory authorities and advisory bodies on how best to determine and present the significance of effects within an air quality assessment. It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively.

4.46 The significance of the likely impacts of odour on local amenity can be assessed by comparing the magnitude of the predicted odour exposure with relevant numerical odour guidelines. The descriptors for the magnitude of odour exposure predicted in this assessment are set out in Table 4.5.

4.47 Inevitably, these descriptors have been based on studies carried out on the impact of odour from Waste Water Treatment Works (WWTWs) because of the considerable research carried out in this area, but the framework is relevant to odours in general.

Table 4.5: Descriptors for Magnitude of Odour Exposure (at Sensitive Receptors)

Descriptors for Range of Odour Concentration $ou_E.m^{-3}$ (98%ile of 1-hr means)	Predicted Odour Concentration $ou_E.m^{-3}$ (98%ile of 1-hr means)	Odour Exposure	Justification
>5 (well above the standard)	> 10	Major	*In a study around nine selected UK STWs [12], over 50% of complaints came from areas where the estimated 98 percentile odour concentration exceeded 10 $ou_E.m^{-3}$. Most commentators seem to agree that odour exposure >10 $ou_E.m^{-3}$ would be a major adverse impact. Unpublished research by UKWIR [13] proposed an industry-wide standard of 10 $ou_E.m^{-3}$ as the basis for determining statutory nuisance and 5 $ou_E.m^{-3}$ as the basis for the design of new works.*
	5 – 10	Moderate	
3 - 5 (well above the standard)	1.5 – 5	Minor	*In a study around nine selected UK STWs [12], only 3% of complaints came from areas where the estimated 98 percentile odour concentration was less than 5 $ou_E.m^{-3}$. These and other studies has led to a 98-percentile standard of 5 $ou_E.m^{-3}$ being proposed as satisfactory in Environmental Impact Statements prepared since the mid-1990s.*
1.5 - 3 (above but not well above the standard)			
1.15 - 1.5 (below but not well below the standard)	0.5 - 1.5	Marginal	*H4 guidance for IPPC installations proposes an Indicative exposure standard of 1.5 $ou_E.m^{-3}$ (98 percentile of 1-hour averages) for odours from WWTWs, to apply at sensitive receptors. Exposure below 1.5 $ou_E.m^{-3}$ to WWTW odours is not expected to give reasonable cause for annoyance. This standard is based on avoiding annoyance and protecting amenity, hence goes beyond just preventing statutory nuisance.*
<1.15 (well below* the standard)			
	< 0.5	Insignificant	*Available research indicates that odour complaints or annoyance are unlikely at this level of exposure [11].*

Notes: * Based on <75% of standard used in NSCA guidance [14] with the relevant standard taken as the Environment Agency Indicative Exposure Standard of 1.5 $ou_E.m^{-3}$ (98^{th} Percentile of 1-hour means).

5 Assessment of Operational Effects

Operational Dust Effects

Magnitude of Dust Emissions Sources

5.1 The operation of the proposed wind turbine tower production facility could potentially be associated with dust. The potential effects of dust associated with the operation of the proposed facility have been assessed taking into account site-specific factors and recommended and or proposed control measures built into the scheme design. Some of the key activities likely to generate dust during the operation of the proposed facility are:

- delivery of raw materials to the site;
- cutting of metal plates to the correct size;
- welding and transfer of welded materials;
- shot blasting and storage of welded materials; and
- application of coating material (spray or dip).

5.2 The duration, frequency and magnitude of dust generation associated with the above operations are estimated in Table 5.1.

Table 5.1: Summary of Dust Emissions and Controls at the Proposed Development Site

Dust Generating Activity	Duration and Frequency of Activity	Likely magnitude of dust emissions	Recommended and or Proposed Dust Control Measure	Effectiveness of dust control measures	Magnitude of residual dust emissions
Delivery of raw materials to the site	Periodic	Low	Enclosed within building.	High	Low
Cutting of metal plates to the correct size	Periodic	Moderate	Enclosed within building. Wet sweeping if necessary. Ensure high standard of good housekeeping.	High	Low
Welding and transfer of welded materials	Periodic	Low		High	Low
Shot blasting and storage of welded materials storage	Periodic	High		High	Low
Application of coating material (spray or dip)	Continuous	High	Manual application done within enclosed building. Spraying done within spray booth fitted with dry filter	High	Low

5.3 A number of active mitigation measures will be incorporated into the operation of the plant, such as the operation of dusty activities within the building and adopting a high standard of good housekeeping. General good practice measures, such as use wet sweeping are also effective in reducing levels of dust.

5.4 Although shot blasting and storage of welded materials would take place in the canopy area, which would be enclosed only on two sides (east and west), we would not expect the dust emissions to lead to significant emissions because most of the dust released would be deposited within 100 m of the source. The adjacent light and heavy industrial facilities have a 'low sensitivity' to dust [15] but are not located within this distance. In addition, dispersal of dust on the northern section would be reduced by the bunds on the northern section of the site.

5.5 Overall, the magnitude of residual dust emissions after mitigation measures are applied is expected to be low, as shown in Table 5.1.

Operational Fugitive Odour Effects

Magnitude of Fugitive Odour Emissions Sources

5.6 The operation of the proposed wind turbine tower production facility could potentially be associated with fugitive odour releases. The potential effects of odour associated with the operation of the proposed facility have been assessed taking into account site-specific factors and recommended and or proposed control measures built into the scheme design. Some of the key activities likely to generate odour during the operation of the proposed facility are:

- delivery, storage and handling of VOC-containing coatings; and
- drying of sprayed materials.

5.7 The duration, frequency and magnitude of odour generation associated with the above operations are estimated in Table 5.2.

Table 5.2: Summary of Fugitive Odour Emissions and Controls at the Development Site

Odour Generating Activity	Duration and Frequency of Activity	Likely magnitude of odour emissions	Recommended and Proposed Odour Control Measure	Effectiveness of odour control measures	Magnitude of residual odour emissions
Delivery, storage and handling of VOC-containing coatings	Periodic	Varies depending on the volume of stored material	Use of closed transfer systems during delivery of coatings if delivered into storage vessels or delivery in sealed containers.	High	Low
Drying of sprayed materials	Continuous	Moderate	Enclosed within building.	High	Low

5.8 Overall, the magnitude of residual odour nuisance associated with the key fugitive odour generating activities is not expected to be significant (i.e. low), if the above recommended and proposed mitigation measures and good housekeeping are adopted.

Operational Point Source Odour Effects

5.9 The highest odour concentrations are expected during very calm conditions, i.e. low wind speeds. In standard ADMS 4.1 runs, meteorological data less than 0.75 $m.s^{-1}$ are skipped. Therefore, a sensitivity test was undertaken to determine if the odour concentrations at 0.3 $m.s^{-1}$ would differ to that at 0.75 $m.s^{-1}$.

5.10 ADMS 4.1 only allows modelling of calm conditions without terrain input files, therefore, model predictions using a calm condition of 0.3 $m.s^{-1}$ without terrain was compared with model predictions when running the standard ADMS 4.1 without calm conditions but with terrain. The predicted odour concentrations from the two scenarios were similar. Therefore, calm conditions have not been considered within the model.

5.11 The 98th percentile of 1-hour mean odour concentrations predicted at sensitive receptors are presented in Table 5.3.

Table 5.3: Predicted 98th Percentile of 1-Hour Mean Odour Concentrations

Receptor ID	Receptor Type	Receptor	98th Percentile Hourly-Mean Odour Concentration ($ou_E.m^{-3}$)	Odour Exposure Descriptor
1	Residential	Somerset Way	0.06	Insignificant
2		Burnt Barn Road	0.06	
3		Rhodfar Avenue	0.07	
4		Innage	0.09	
5		Mathern House	0.07	
6		Birdwood	0.04	
7		James Stephen	0.06	
8		Caerwen Lane	0.05	
9	Footpath / Boundary	B1	0.56	Marginal
10		B2	0.56	
11		B3	0.45	Insignificant
12		B4	0.30	
13	Boundary	B5	0.21	
14		B6	0.18	
15	Heavy / Light Industrial	B7	0.40	
16	Footpath	B8	0.11	
17	Heavy / Light Industrial	B9	0.29	
Maximum			*0.56*	*Marginal*
Minimum			*0.04*	*Insignificant*

5.12 The 98th percentile hourly-mean odour concentrations predicted at residential receptors, the footpath, the boundary of the proposed development and the adjacent heavy and light industrial facilities were 'well below' the 98th percentile Indicative Odour Exposure standard of 3 $ou_E.m^{-3}$.

5.13 The highest predicted 98th percentile hourly-mean odour concentration was 0.56 $ou_E.m^{-3}$, at the boundary / footpath receptors. As stated in paragraph 4.42, the Indicative Odour Exposure Standard should not apply at the boundary of the proposed development. However, this stringent Indicative Odour Exposure Standard was still achieved at the boundary.

5.14 It should be noted that comparing the predicted odour concentrations at the various receptor types to the Indicative Odour Exposure Standard of 3 $ou_E.m^{-3}$, is very conservative. This is because some of the receptors have lower odour sensitivity, i.e. heavy / light industrial has a

'low' to 'medium' odour sensitivity, and as such should typically be compared to a higher Indicative Odour Exposure Standard. However, this stringent Indicative Odour Exposure Standard was still achieved at the 'low' to 'medium' sensitivity receptors.

5.15 According to the significance criteria shown in Table 4.6, the magnitude of odour exposure at sensitive odour receptors (including footpath) is considered to be 'insignificant' to 'marginal'.

5.16 Therefore, the point source odour effects from the proposed wind-turbine tower production facility are unlikely to lead to a significant loss of amenity or other adverse odour effects on surrounding land uses.

Summary

5.17 The effects of fugitive dust and odour associated with the operation of the wind-turbine tower production facility have been assessed to be 'low' if the recommended and proposed mitigation measures are applied.

5.18 The 98th percentile hourly mean odour concentrations at sensitive odour receptors were predicted to be below the Indicative Odour Exposure Standard of 3 $ou_E.m^{-3}$. This standard was also achieved at the site boundary, although the criteria should not strictly be applied at the site boundary. Overall, the odour effects from point source emissions are expected to range from 'insignificant' to 'marginal' according to the significance criteria adopted within this assessment.

6 VOCs Emission Limit Compliance

6.1 Appendix A provides the details of the calculations used to determine the VOCs concentration ($mgC.m^{-3}$) from each coating and the total VOCs from the facility, based on the amount of coatings expected to be consumed per year by the facility when fully operational at 50 weeks in a year at 24 hours a day; and the volumetric flow rate ($m^3.s^{-1}$).

6.2 The total VOCs concentration from the facility was estimated to be 13 $mgC.m^{-3}$. This is well below the VOCs emission limit value (of 50 $mgC.m^{-3}$) which is likely to be applied[iv] to the proposed wind turbine tower facility.

6.3 Therefore, it is concluded that the proposed wind turbine tower production facility would comply with its VOCs emission limit.

[iv] Based on a consumption of more than 15 tonnes of solvent per year (approximately 172.4 tonnes).

7 Summary and Conclusions

7.1 An air quality assessment has been undertaken by RPS to support the planning application for a change of use in order to operate a wind turbine tower production facility.

7.2 The assessment considered the effects of fugitive odour and dust; and point source odour effects associated with the proposed wind turbine tower production facility. In addition, the VOC concentration of the proposed wind turbine tower production facility was compared with the VOC emission limit.

7.3 The effects of fugitive dust and odour associated with the operation of the wind turbine tower production facility have been assessed to be 'low' if the recommended and proposed mitigation measures are incorporated as part of the operation of the facility.

7.4 Point source odour emissions from the exhaust stacks above the spray booth section of the proposed facility have been predicted at sensitive receptors. The 98th percentile hourly-mean odour was predicted to be below the Indicative Odour Exposure Standard of 3 $ou_E.m^{-3}$ at all modelled sensitive odour receptors. This standard was also achieved at the site boundary (even though it is not designed to be applied at site boundaries). Overall, the odour effects from point source emissions are expected to range from 'insignificant' to 'marginal' according to the significance criteria adopted within this assessment.

7.5 The total VOCs concentration from the facility was estimated to be 13 $mgC.m^{-3}$. This is well below the VOCs emission limit value (of 50 $mgC.m^{-3}$). As such, the proposed wind turbine tower production facility is expected to comply with its VOCs emission limit.

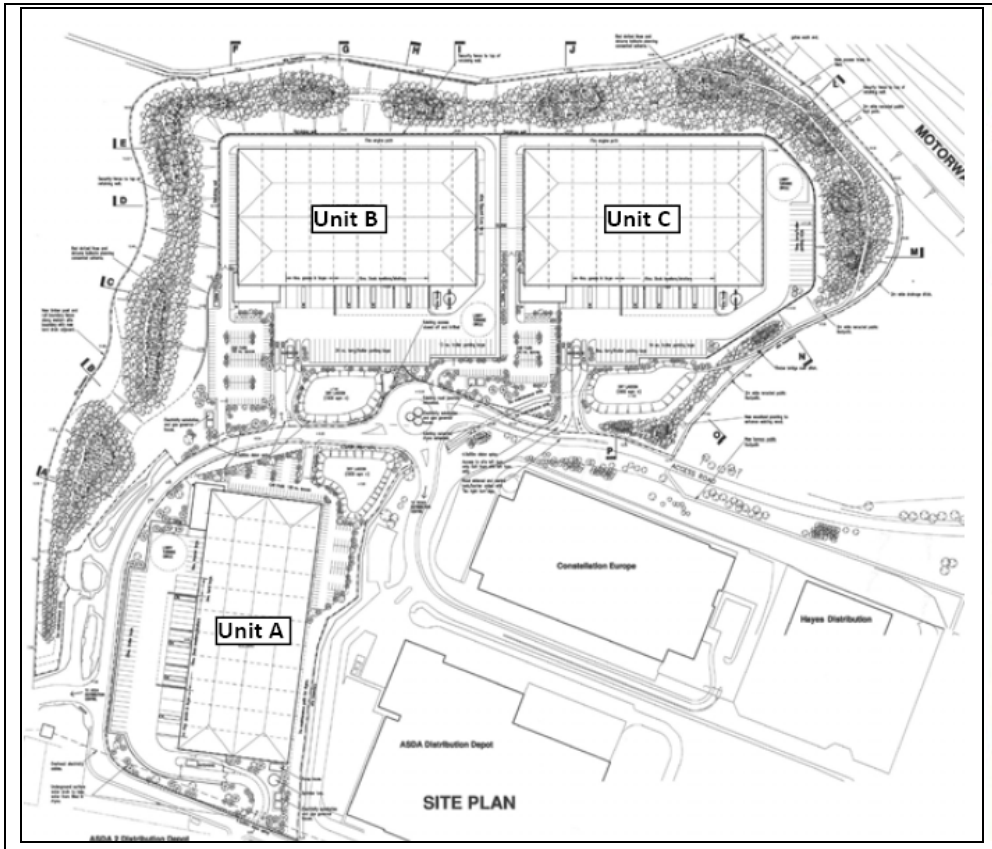
7.6 The approach to the air quality assessment for the change of use adopts the current UK best practice as recommended by Environment Agency's draft H4 Guidance Note.

7.7 In conclusion, the proposed wind turbine tower production facility is not expected to result in any significant odour or dust effects and does not conflict with the advice given in PPS23 or policies given in regional and local plans. Odour and dust are not considered to be material constraints for the proposed development.

Figures

Figure 1

Map Showing the Proposed Development Site



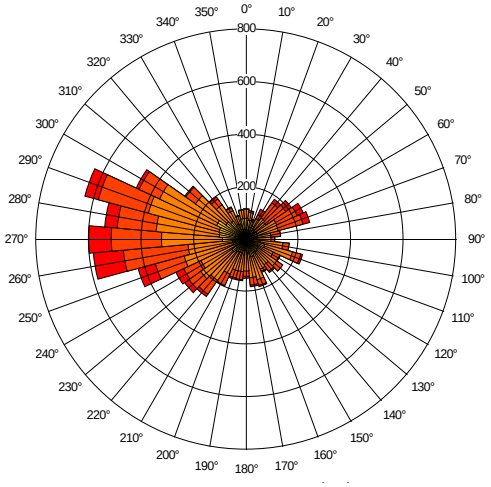
RPS

Map Showing the Proposed Development Site

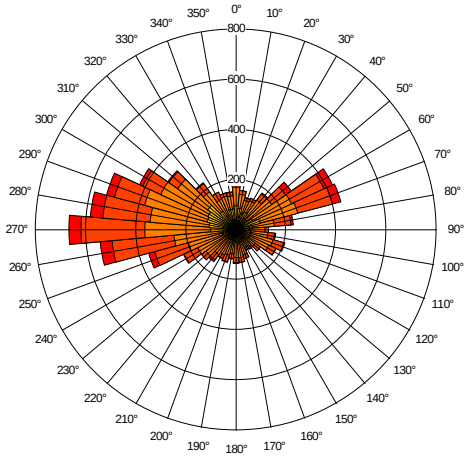
Figure 1

Figure 2

Windroses for Rhoose Meteorological Station



Rhoose 2000



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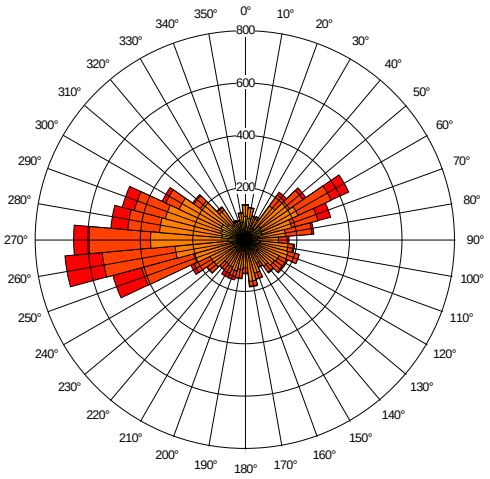
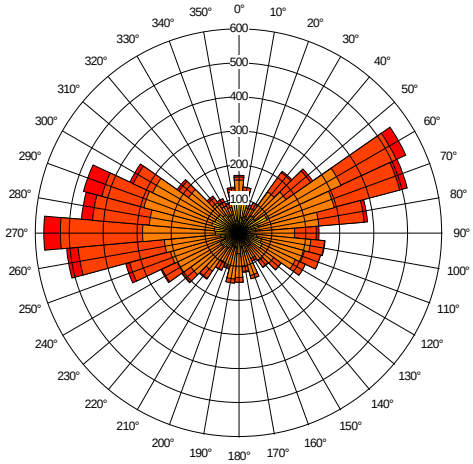
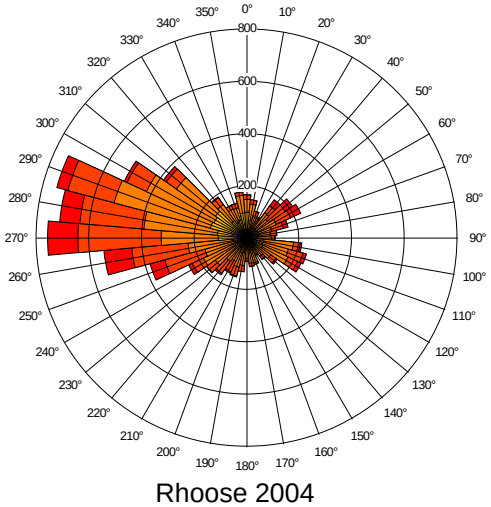


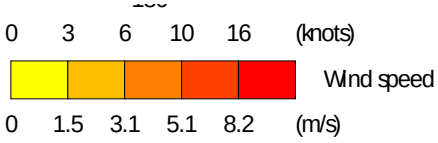
Rhoose 2002



Rhoose 2003



Rhoose 2004

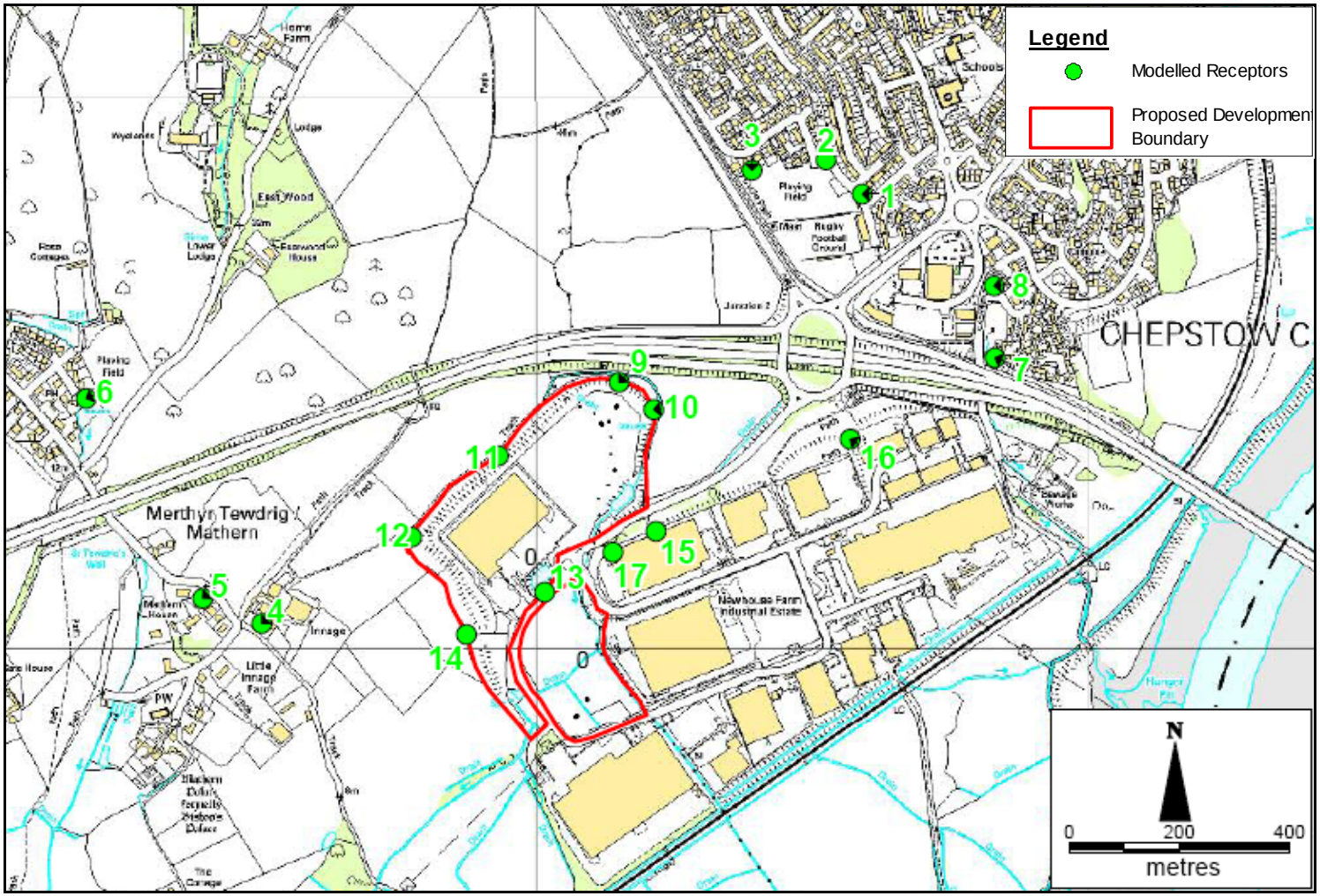


Key

RPS	Windroses for Rhoose Meteorological Station
	Figure 2

Figure 3

Map Showing Modelled Receptors and Proposed Development Site



RPS

Map Showing Modelled Receptors and Proposed Development Site

Figure 3

Appendices

Appendix A

Estimation of VOC Concentration and Odour Emission Rate

Amount of Coatings Used Per Year

Coatings	Litres per year	Density ($g.ml^{-1}$)	Mass (g)
HEMPADUR ZINC 17349	16344	2.64	43148160
HEMPEL'S 160D9	4000	2.59	10360000
HEMPATHANE HS 55610	24333.8	1.44	35040600
HEMPADUR 47149	38304	1.71	65499840
HEMPEL'S CURING AGENT 97040	4086	0.96	3922560
HEMPEL'S CURING AGENT 95360	1000	0.93	930000
HEMPEL'S CURING AGENT 98140	9576	0.96	9192960
HEMPEL'S CURING AGENT 97050	3746.3	1.14	4270725

Spray booth Emissions Data

Actual Volumetric Flow Rate per flue ($m^3.hr^{-1}$)	30000
Actual Volumetric Flow Rate per flue ($m^3.s^{-1}$)	8.33
Actual Volumetric Flow Rate for 11 flues ($m^3.s^{-1}$)	91.7

VOC Content of Coatings

	Max. VOC in Bulk Material (%)	CAS Number	Molar Mass	Formula	Mass of VOC in Material (g)	Emission Rate ($g.s^{-1}$)	Emission Rate ($mg.s^{-1}$)	Emission Conc. ($mgC.m^{-3}$)	ODT (ppm) at 293k	ODT ($mg.m^{-3}$) at 293k	Odour Emission Conc. ($ou_e.m^{-3}$)	Odour Emission Rate ($ou.s^{-1}$) for 11 flues	Odour Emission Rate ($ou.s^{-1}$) per flue
HEMPADUR ZINC 17349													
n-butanol	5	71-36-3	74.12	$CH_3(CH2)_3OH$	2157408.0	0.071	71.343	0.778		0.090	9	793	72
solvent naphta (petroleum), light arom	3	64742-95-6	114	C_8H_{18}	1294444.8	0.043	42.806	0.467		0.200	2	214	19
Ethylbenzene	3	100-41-4	106.17	C_8H_{10}	1294444.8	0.043	42.806	0.467	0.170	0.751	1	57	5
HEMPEL'S 160D9													
1 methoxy-2-propanol	10	107-98-2	90.12	$CH_3OCH_2CHOHCH_3$	1036000.0	0.034	34.259	0.374		0.012	31	2808	255
xylene	5	1330-20-7	106.17	C_8H_{10}	518000.0	0.017	17.130	0.187		0.078	2	220	20
solvent naphta (petroleum), light arom	5	64742-95-6	114	C_8H_{18}	518000.0	0.017	17.130	0.187		0.200	1	86	8

HEMPATHANE HS 55610													
solvent naphta (petroleum), light arom	15	64742-95-6	114	C_8H_{18}	5256090.0	0.174	173.813	1.896		0.200	9	869	79
xylene	5	1330-20-7	106.17	C_8H_{10}	1752030.0	0.058	57.938	0.632		0.078	8	743	68
HEMPADUR 47149													
xylene	10	1330-20-7	106.17	C_8H_{10}	6549984.0	0.217	216.600	2.363		0.078	30	2777	252
n-butanol	5	71-36-3	74.12	$CH_3(CH_2)_3OH$	3274992.0	0.108	108.300	1.181		0.090	13	1203	109
1-methoxy-2-propanol	3	107-98-2	90.12	$CH_3OCH_2CHCH_3$	1964995.2	0.065	64.980	0.709		0.090	8	722	66
ethylbenzene	3	100-41-4	106.17	C_8H_{10}	1964995.2	0.065	64.980	0.709	0.170	0.751	1	87	
HEMPEL'S CURING AGENT 97040													
1-methoxy-2-propanol	15	107-98-2	90.12	$CH_3OCH_2CHCH_3$	588384.0	0.019	19.457	0.212		0.012	17	1595	145
xylene (dimethyl benzene)	25	1330-20-7	106.17	C_8H_{10}	980640.0	0.032	32.429	0.354		0.078	5	416	38
ethylbenzene	5	100-41-4	106.17	C_8H_{10}	196128.0	0.006	6.486	0.071	0.170	0.751	0	9	1
HEMPEL'S CURING AGENT 95360													
xylene (dimethyl benzene)	50	1330-20-7	106.17	C_8H_{10}	465000.0	0.015	15.377	0.168		0.078	2	197	18
n-butanol	10	71-36-3	74.12	$CH_3(CH_2)_3OH$	93000.0	0.003	3.075	0.034		0.090	0.37	34	3.11
ethylbenzene	10	100-41-4	106.17	C_8H_{10}	93000.0	0.003	3.075	0.034	0.170	0.751	0.04	4	0.37
HEMPEL'S CURING AGENT 98140													
xylene (dimethyl benzene)	25	1330-20-7	106.17	C_8H_{10}	2298240.0	0.076	76.000	0.829		0.078	11	974	89
ethylbenzene	5	100-41-4	106.17	C_8H_{10}	459648.0	0.015	15.200	0.166	0.170	0.751	0	20	2
HEMPEL'S CURING AGENT 97050													
solvent naphta (petroleum), light arom	100	64742-95-6	114	C_8H_{18}	4270725.0	0.141	141.228	1.541		0.200	8	706	64
							Total	**13**			**159**	**14533**	**1313**

Notes:
ODT = Odour Detection Threshold
ODT in ppm obtained from the 'Review of odour character and Thresholds Science Report: SC030170/SR2' report by Environment Agency March 2007
ODT in ppm converted to $mg.m^{-3}$ using formula: [ppm x (Molar mass of compound /22.4) x (273/293)]
ODT in $mg.m^{-3}$ obtained from EA Draft H4 Guidance Note, Appendix 10
The following VOCs were not included in the above table as no ODT was available. However, they were present in limited amounts and would not significantly affect the overall estimated odour emission rates.

- Bis (1,2,2,6,6-pentamethy;-4-piperidyl) sebacate (0.3% in HEMPATHANE HS 55610)
- 2,4,6-tris(dimethylaminomethyl)phenol (10% in HEMPEL'S CURING AGENT 97040 and 10% in HEMPEL'S CURING AGENT 98140)
- Benzyl alcohol (25% in HEMPEL'S CURING AGENT 98140)

References

1 Directive 2004/42/CE of the European Parliament and of the Council of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC.

2 OPSI, November 2005, Volatile Organic Compounds in Paints, Varnishes and Vehicle Refinishing Products Regulations'. Statutory Instrument 2005, No. 2773).

3 OPSI, April 2008, Environmental Permitting (England and Wales) Regulations 2007. Statutory Instruments 2007 No. 3538. Environmental Protection, England and Wales.

4 Defra, October 2009, Environmental Permitting - Environmental Permitting Guidance The Solvent Emissions Directive. For the Environmental Permitting (England and Wales) Regulations 2007.

5 Defra, March 2004, The Secretary of State's Guidance for Coating of Metal and Plastic Processes - Process Guidance Note 6/23(04).

6 European Community (EC) Directive 1999/13/EC of 11 March 1999 on the limitation of emissions of volatile organic compounds due to the use of organic solvent in certain activities.

7 ODP, 2004, Planning Policy Statement 23: Planning and Pollution Control.

8 MCC, June 2006, Unitary Development (UDP).

9 Environment Agency, October 2002, Environment Agency Technical Guidance Note IPPC H4, Horizontal Guidance for Odour, DRAFT.

10 Defra, 2004, Consultation draft, Local Authority Guide on Odour Nuisance from Sewage Treatment Works.

11 T Van Harreveld; N Jones & M Stoaling, July 2002, Assessment of Community response to odorous emissions. Environment Agency P4-095/TR.

12 Hobson and Yang, 2001, Odour Control in Wastewater Treatment – a Technical Reference Document, UK Water Industry Research.

13 UKWIR, 1999, CoP for Odour Control in Wastewater Treatment, Vol 1&2, Draft for Discussion, UKWIR Workshop, London 10 June 1999.

14 NSCA, 2006, Development Control: Planning for Air Quality.

15 ODPM March 2005, Minerals Policy Statement 2: Controlling and mitigating the environmental effects of mineral extraction in England - Annex 1: Dust

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